Properties of the cometary dust particles from 67P/Churyumov-Gerasimenko measured in-situ by Rosetta/COSIMA

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The COmetary Secondary Ion Mass Analyzer (COSIMA) on board the Rosetta orbiter collected dust particles in the coma of 67P/Churyumov-Gerasimenko, imaged them with its internal camera, the COSISCOPE, with a resolution of 14 μm x 14 μm, and took mass spectra with a Time-Of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) [1] to determine their composition with regard to elements, mineralogy, and organic matter.
During the two years of the mission, about 35,000 particles and particle fragments have been collected and imaged. TOF-SIMS spectra have been acquired on several hundreds of them.
Both the dust flux and the particles size distribution varied along the comet trajectory around the Sun [2]. The cometary particles easily fragmented upon impact on the COSIMA targets at very low velocity, revealing their fragile nature [3]. The elemental composition of the dust particles of 67P shows a high carbon content and similarities with the composition of the comet 1P/Halley [4,5]. The organic material in the particles measured by COSIMA is very similar to the insoluble organic matter extracted from carbonaceous chondrites and reveals pre-accretional processing of the organic material [6]. Hints for high-temperature minerals, the so-called CAIs (Calcium-Aluminum-rich inclusions), were also found in some of the collected particles [7], supporting the possibility of large scale transport of high temperature materials to the comet forming region in the early Solar system [8].

[1] Kissel et al., 2007, Space Science Reviews, 128, 823
[2] Merouane et al., 2016, A&A, 596, A87
[3] Hornung et al., 2016, P&SS, 133, 63
[4] Hilchenbach et al., 2016, ApJL, 816, 2, L32
[5] Bardyn et al., submitted
[6] Fray et al., Nature, 538, 7623, 72-74
[7] Paquette et al., M&PS, 51, 7, 1340-1352
[8] Bockelée-Morvan et al., 2002, A&A, 384, 1107-1118